Procedures for handling plant tissue samples

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The way that plant tissue samples are handled between time of collection and arrival at the laboratory greatly affects the quality of analytical results. After collection, samples continue to respire and to be subject to microbial decay. As a result of these processes, carbon is lost (as CO_2 via respiration or by microbial consumption), dry plant mass decreases, and some essential nutrients become concentrated in the tissue. To get the most meaningful data from tissue analysis, minimize respiration and decay as much as possible.

If the delivery time to the plant laboratory (or to a drying oven) is expected to exceed 12 hours, refrigerate or air-dry the samples. Refrigerated samples should be held at 40 °F (5 °C) until delivery to the lab. They should never be frozen.

The other option is to air-dry samples for 24 hours to lower moisture content. Place samples in the sun and/or loosely packed in a paper bag for optimum air movement. NEVER PLACE SAMPLES IN PLASTIC BAGS since plastic retains moisture, thus accelerating respiration and decay.

When properly air-dried, samples should not begin to decay for two or three days. If the samples must be held for a longer period of time before shipping, try to dry them at 150 °F (65 °C) in a ventilated oven for about 12 to 48 hours until a constant dry weight is obtained. Leaving the oven door ajar will improve ventilation. Upon arrival at the NCDA&CS Agronomic Division, tissue samples are placed in an oven at 176 °F (80 °C) to dry overnight prior to processing.

A study completed by Lockman (1970) highlighted how nutrient concentrations can change when proper sample handling procedures are not followed (Table 1). He looked at nutrient concentrations in corn leaves subjected to three states of decay: no decay, moderate decay (strong smell but no structural breakdown) and severe decay (structural breakdown). The no-decay samples were put into the oven immediately after collection while the others were left out to promote decay. The length of time associated with moderate and severe decay was not indicated in his paper. Lockman found that nitrogen concentration decreased and most other nutrient concentrations increased as the decay process proceeded.

In conclusion, to get meaningful results from plant tissue analysis, follow the above guidelines for handling samples. The procedure is easy and provides accurate results upon which to base corrective action.

Table 1. Percent changes (+ = increase; – = decrease) in nutrient concentrations within plant tissue samples as compared to levels measured in no-decay tissue *

Sample type	Dry Weight	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B
Moderate decay	–36	–25	+36	+51	+23	+49	+88	+4	+39	+19	0	+18
Severe decay	–52	–4	+106	+104	+127	+116	+111	+50	+55	+100	+55	+111

* Summary of findings presented in Lockman RB. 1970. Plant sample analyses as affected by sample decomposition prior to laboratory processing. Commun Soil Sci Plant Anal 1:13–19.